# DIGITAL COMPUTER NEWSLETTER

The purpose of this newsletter is to provide a medium for the interchange, among interested persons, of information concerning recent developments in various digital computer projects

OFFICE OF NAVAL RESEARCH • MATHEMATICAL SCIENCES DIVISION

Vol. 2, No. 2 1 May 1950

NAVEXOS-P-645

TABLE OF CONTENTS





## NAVAL PROVING GROUND CALCULATORS

The Aiken Relay Calculator (Mark II) has been in continuous productive work at the Naval Proving Ground, Dahlgren, Virginia, since September 1948. Since January 1950, it has been operated 24 hours a day, five days a week. A number of new circuits have been added to the machine since its delivery to Dahlgren, one of the latest being the installation of read-back checking devices on all input and output value tapes.

The Mark III Calculator was delivered to the Naval Proving Ground at Dahlgren during the month of March 1950 and is in the process of being reassembled. The operating staff for the machine has been assembled from personnel who worked on the construction of the machine and two men transferred from other Proving Ground activities to this department. The present staff of mathematicians is being augmented to take care of the programming for this new machine. It is expected that Mark III will be in productive operation by January 1951.

## RAYTHEON COMPUTERS

The parallel adder for the thirty binary digit Raytheon Computer has been constructed and component tested. System tests on the adder should be completed during May. Production of the central control, external memory, and hunt circuitry is continuing. Production of multi-channel magnetic recording heads has reached the level of fifteen 6-channel assemblies per month.

## UNIVAC

The Eckert-Mauchly Computer Corporation recently became a subsidiary of Remington Rand, Inc. Production schedules have been stepped up and two complete systems are being constructed





4

simultaneously. These will be followed by a lot of at least three additional systems. It is anticipated that production of the first lot will be completed and tested this year.

## ABERDEEN PROVING GROUND COMPUTERS

Eniac - This machine is in routine service. During the past month it has been available for computation (i.e., free from electrical and mechanical difficulties) 86% of the time. The utilization efficiency of the machine is 67%. The difference between the two figures is brought about by the loss of time required to set the machine up and also loss of time due to programming errors.

Edvac - The design of an interim input-output system for the Edvac utilizing teletype tape as the transfer medium is complete. Construction of the equipment required for this type of operation is well under way.

## THE CALIFORNIA DIGITAL COMPUTER

Construction of the first units of the California Digital Computer has been completed and reliability tests of these units as a system will begin on May 1, 1950. These units comprise the memory drum (operating on one four-channel 200-sector band), the sector counter and sector coincidence gates, the reading and writing circuits for four-channel operation, the timing circuits, and the first of the arithmetic registers. Completion of the band switch and construction of the address register and the second arithmetic register which will include the adder is expected by July 1, and performance of addition routines should be possible at that time. The arithmetic registers will be used also for reading the input tapes and loading the drum. The input tape-reader, in bread-board form, has been constructed. Intensive study of programming and preparation of input tapes will begin this summer.

## INSTITUTE FOR ADVANCED STUDY COMPUTER

Since the publication of the last Newsletter the principal emphasis has been placed by the group at the Institute for Advanced Study on the fabricat' ו of the memory organ. Now virtually all of this fabrication has been completed and the final assembly of the unit is well under way. The initial testing of the memory is being started and the results will be reported in the next Newsletter.

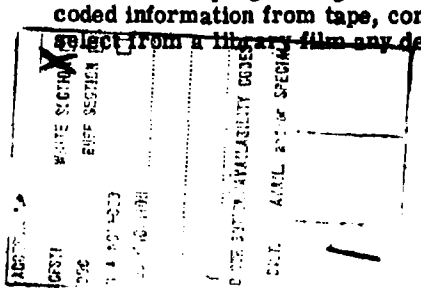
Now that the design and construction of the memory organ are nearly finished, attention will return to the arithmetic organ. Here it remains only to assemble a few control chassis for the division operation and to start engineering and life tests comparable to those made for the multiplication operation.

## PROJECT WHIRLWIND

All of the Whirlwind I is operating except electrostatic storage and terminal equipment. The first bank of 16 storage tubes, with all associated circuits, have recently been installed and are expected to operate in the computer by June or July. Initial minimum terminal equipment will include two Eastman Kodak reader-recorders, perforated paper tape, and typewriters. Transfer between tape and film will first be through the computer input-output register. Additional photographic film units, direct connection from film to tape and typewriter, magnetic erasable storage, and more electrostatic storage capacity are to be added during the following year.

An accelerated life test at high heater temperature seems effective for predicting vacuum tube susceptibility to cathode interface formation.

Work is progressing on coded "preparatory" programs to enable the computer to accept teletype-coded information from tape, convert that information to proper binary form as an order or a number, select from a library film any desired subroutines and adapt them to their assigned storage locations.



## MADDIDA COMPUTER

The Northrop Aircraft Company has developed for the Air Force a new electronic computer, the Magnetic Drum Digital Differential Analyzer (Maddida).

This machine is, as the name implies, specifically designed to solve ordinary differential equations. Careful design, taking full advantage of the special-purpose character of the device, has resulted in a machine employing sixty-eight vacuum tubes and one magnetic drum, which, nevertheless, possesses the integrating capacity of a twenty-two integraior differential analyzer. Very satisfactory reliability of operation has been obtained.

## INSTITUTE FOR NUMERICAL ANALYSIS COMPUTER

All of the chassis of the arithmetic unit have been completed and are now in the process of being tested. Two-thirds of the memory unit has been completely assembled and checked. The control unit has been in operation for some time and has performed satisfactorily in connection with the testing of the arithmetic and the memory units. The input and output circuits have been completely designed and are under construction at present. The power supply has been installed, tested, and found to be satisfactory. The ventilating system for the machine is now being installed.

In order to expedite the completion of the computer the machine will be first put into operation with 256 words of electrostatic memory. This will be increased to 512 words as soon as practical, since all the necessary additional chassis for the arithmetic unit, etc., have already been constructed. In addition to the electrostatic memory, which consists of standard cathode ray tubes, it is planned to install an 8192 word magnetic drum to serve as an auxiliary memory for the machine.

## NBS COMPUTER

The central portions of the computer (including the control, arithmetic, and 512 word acoustic memory units) have been constructed and assembled. In addition, the electrical input-output circuitry, or shift register, which allows matching asynchronous external-machine pulse rates to the megacycle repetition rates of the computer, has been constructed and installed.

Currently the machine is being debugged and simultaneously a three-tube 32-word prototype electrostatic memory system is being completed for trial with the computer. The machine assembly, using punched paper tape input-output equipment, is sufficiently advanced to permit making test runs using such subroutines as: (1) decimal to binary conversion and (2) keeping a tally of repetitive multiplications. It is expected that an experimental magnetic wire input and a 10-channel prototype high-speed output printer using a photographically recorded cathode ray tube display will be available for test with the computer early in the summer.

## COMPUTERS, MANCHESTER UNIVERSITY, ENGLAND

An interesting feature of the Manchester computer is the B-box, which is used to provide a convenient way of changing orders. An order consists of three parts: a so-called "B" digit, an address in the memory, and a code to represent one of 32 operations to be performed on the number in the given address. The B-box stores two lines of information designated $B_0$ and $B_1$. If the "B" digit of a given order is 0 the contents of $B_0$ (normally 0) are added to the order before it is executed; if the "B" digit is 1, the contents of $B_1$ are added. In the performance of a certain sequence of operations on various sets of data, for example, the sequence need be programmed only once (containing the addresses of the first set of data) and the addresses of later sets of data can be indicated by inserting a line in $B_1$. The programmer is thus provided with a means of modifying an order just before it is executed and yet leaving it unchanged in the memory.

A second essentially similar computer is being built for the University by the Ferranti Company, Limited of Manchester. This computer will store about 20,000 digits in the electronic CRT memory and about 250,000 digits in the magnetic memory. Its speed will be about 1-1/2 times that of the present

computer, which adds two forty binary digit numbers in approximately 1.8 milliseconds and multiplies in a maximum time of 40 milliseconds.

## TELECOMMUNICATIONS RESEARCH ESTABLISHMENT COMPUTER

Digital computer research at T.R.E. Malvern is directed by Dr. A. Uttley. Operating in a parallel mode, the computer under construction will employ the F. C. Williams cathode ray tube and circuits for high speed storage with a magnetic drum for auxiliary storage. A 2048 tooth phonic wheel coupled to the drum will act as a master clock for the electronic circuits, thus solving the problem of synchronizing the drum with the rest of the computer.

A novel two-wire system is employed, in which a positive pulse on one wire represents a one while a positive pulse on the other represents zero. The absence of pulses on both wires, or the presence of two positive pulses indicates an error or a machine failure.

## BARK COMPUTER, SWEDEN

The BARK (Binär Auto-Matisk Relä-Kalkylator), the relay computer mentioned in the last Newsletter, has been completed and has performed satisfactorily, during continuous runs of up to 8 hours, at speeds of about 200 milliseconds per addition and 300 milliseconds per multiplication. It is hoped that, by further trimming, the speeds, which are adjustable by means of potentiometers, can be increased somewhat.

Containing about 5200 relays, the machine cost less than $100,000, including design, development, and construction. The project was under the direction of Dr. Conny Palm and most of the design work was done by Harry Freese and Gosta Neovius.

Comments, letters to the editor, and additional contributions for inclusion in the Newsletter should be addressed to:

Code 434
Office of Naval Research
Navy Department
Washington, D. C.



51 14129